Astron. Astrophys. 349, 819–824 (1999)

ASTRONOMY
AND
ASTROPHYSICS

# An anomalous low-state from the globular cluster X-ray source X 1732-304 (Terzan 1)

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Received 11 June 1999 / Accepted 5 July 1999

**Abstract.** During a BeppoSAX observation of the X-ray burst source X 1732-304 located in the globular cluster Terzan 1 in April 1999, the source was detected in an anomalous low-state with an X-ray luminosity of $1.4 \times 10^{33}$ erg s$^{-1}$, about 300 times fainter than the lowest previously reported measure of the persistent flux. The spectral shape and intensity of this low-state emission is similar to that of a number of neutron star soft X-ray transients in quiescence, being well fit by a $\simeq$0.34 keV blackbody together with a power-law with a photon index of $1.0\pm^{1.0}_{1.3}$. These similarities suggest that the same mechanism, such as the inhibition of accretion due to the propeller effect, is also operating in X 1732-304. Alternatively, the X 1732-304 low-state may be due to obscuration of the line of sight to the central neutron star, with only scattered and/or reflected X-rays being detected. The possibility that the source detected by BeppoSAX is not X 1732-304, but a nearby dim source of the cluster field (what would make the observed dimming of X 1732-304 even more remarkable) is also discussed.

**Key words:** accretion, accretion disks – stars: individual: X 1732-304 – stars: neutron – Galaxy: globular clusters: individual: Terzan 1 – X-rays: general

## 1. Introduction

Luminous ($L_X \gtrsim 10^{36}$ erg s$^{-1}$) X-ray sources have been observed in 12 Galactic globular clusters (see Hut et al. 1992). At least five of them are transient sources (Verbunt et al. 1995) and five of them have probable optical counterparts (see Deutsch et al. 1998a). The detection of type I bursts from all of them but one, suggests that these are binary systems containing neutron stars (NS). The population density of X-ray binaries is a factor $\sim$10 higher in globular clusters than in our Galaxy. Moreover, no black hole transients have been observed in globular clusters. This suggests different formation or evolutionary scenarios for cluster and galactic Low-Mass X-ray Binaries (LMXRBs) (Clark 1975; Verbunt 1988; Phinney & Sigurdsson 1991). Nevertheless, there is no compelling evidence for systematic differences in their spectral (Christian & Swank 1997) or timing (Barret et al. 1999) properties.

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A bursting X-ray source was detected in the core-collapsed (core radius $r_c = 2.75''$; Djorgovski 1993) globular cluster Terzan 1 at the beginning of the 1980s with *Hakucho* (Makishima et al. 1981; Inoue et al. 1981), and subsequently identified with the source of soft persistent emission X 1732-304 (Parmar et al. 1989; Johnston et al. 1995). It is now assumed that X 1732-304 is also the source of hard X-rays observed with both SIGMA and ART-P telescopes (Borrel et al. 1996; Pavlinsky et al. 1995). In this *Paper* we report the discovery of an anomalous low-state from X 1732-304, during which the X-ray intensity was a factor $\gtrsim$300 lower than any previously reported measure.

## 2. Data analysis

The payload onboard BeppoSAX (Boella et al. 1997a) includes two co-aligned imaging instruments: a Low-Energy Concentrator Spectrometer (LECS; 0.1–10 keV; Parmar et al. 1997), and a Medium-Energy Concentrator Spectrometer (MECS; 1.8–10 keV; Boella et al. 1997b). The region of sky containing X 1732-304 was observed by BeppoSAX on 1999 April 03 12:52 UT to April 04 15:29 UT. Good data were selected from intervals when the elevation angle above the Earth's limb was $>4^\circ$, when the instrument configurations were nominal, and when the star tracker aligned with the pointing direction was operating, using the SAXDAS 2.0.0 data analysis package. The resulting exposure times are 20.2 ks and 47.1 ks for the LECS and MECS, respectively.

Fig. 1 shows the MECS image of the X 1732-304 field. A source is detected in the central $8'$ region, well within the window support ring (where instrumental vignetting is small and spilling of the calibration source photons negligible). The source J2000 centroid is at $\mathrm{RA} = 17^{\mathrm{h}}\,35^{\mathrm{m}}\,43\overset{\mathrm{s}}{.}7$ and $\mathrm{Decl.} = -30^\circ\,28'\,38''$. The distance from the best-fit ROSAT High Resolution Imager (HRI) centroid position for X 1732-304 (which coincides within $5''$ with the cluster core; Johnston et al. 1995) is $0\overset{\prime}{.}9$, consistent with the positional reconstruction accuracy for on-axis sources with BeppoSAX. The mean background-subtracted count rate, CR, is $(4.1 \pm 0.5) \times 10^{-3}$ s$^{-1}$. The MECS image is slightly elongated in the NE-SW direction and the contribution of any unresolved contaminating sources is $\lesssim$25% of the total flux. In the LECS

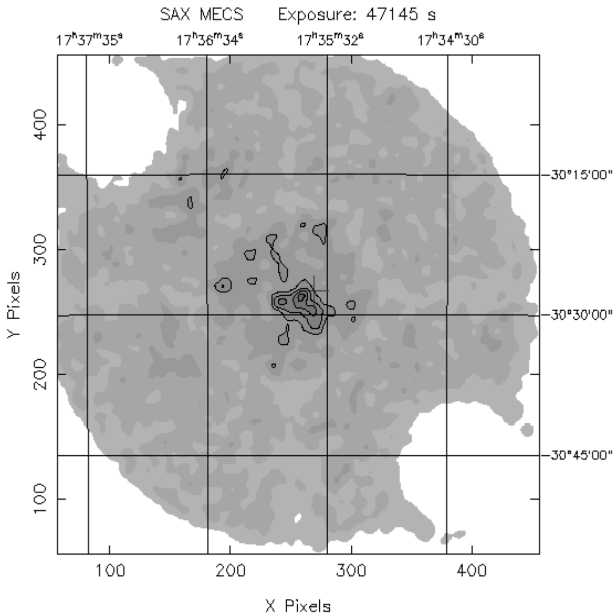


**Fig. 1.** The MECS image of the of the X 1732-304 field. Solid lines indicates iso-intensity contours, in steps of $1\sigma$ above the local background level and starting at $5\sigma$. The cross indicates the HRI position of X 1732-304 from Johnston et al. (1995)

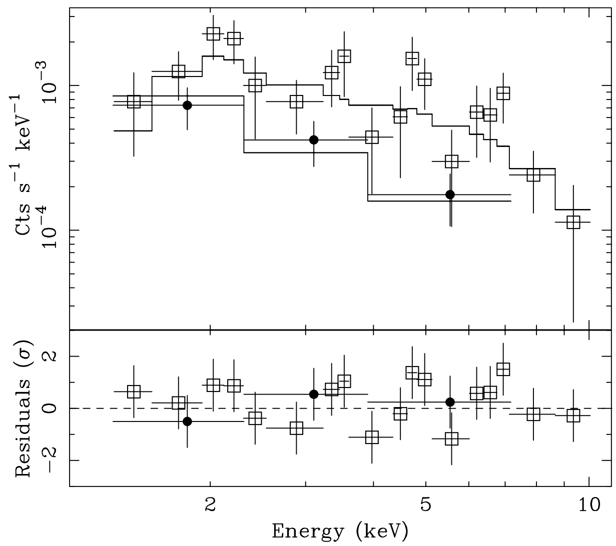


**Fig. 2.** LECS (solid circles) and MECS (empty squares) spectra. The lower panel shows the residuals in units of standard deviations when the best-fit absorbed blackbody and power-law model is applied to the data. Each data point has a signal-to-noise ratio >1.5

the same source is detected with $\mathrm{CR} = (2.5 \pm 0.7) \times 10^{-3}\,\mathrm{s}^{-1}$. X 1732-304 is not detected in the two high-energy non-imaging instruments onboard BeppoSAX, consistent with the observed faint flux level.

We cannot exclude the possibility that the detected source is not X 1732-304. Deep ROSAT HRI imaging of several globular clusters revealed a population of $\mathrm{L_X} \sim 10^{33}$–$10^{34}$ erg s$^{-1}$ sources (Johnston et al. 1994; Hasinger et al. 1994). We reanalyzed the ROSAT HRI observation of Terzan 1 and found no additional sources in its 0°.6 field of view. However, the 90% confidence upper limit to the 0.1–2 keV flux of any undetected source within 8′ of X 1732-304 is $1.8 \times 10^{-13}$ erg s$^{-1}$ cm$^{-2}$, which corresponds to a LECS count rate of $\sim 3 \times 10^{-3}$ s$^{-1}$ in the same band, assuming the best-fit model given in Sect. 3. We note that if the BeppoSAX source is not X 1732-304, then its dimming is even more dramatic than discussed here, and most of the conclusions of this *Paper* apply *a fortiori*. This point is discussed further in Sect. 4.3.

## 3. X-ray spectrum

Spectra were extracted centered on the source centroid using circular regions of 2′ and 4′ radius for the LECS and MECS, respectively. This is a non standard extraction radius for the LECS, whose response matrix is calibrated for an 8′ extraction radius. However, the derived spectral uncertainties are dominated by the counting statistics in such a faint source. No significant variability is observed in the MECS 2–10 keV light curve binned in 5760 s intervals, with a $3\sigma$ upper limit on the rms fractional variability of 14%. Since Terzan 1 is located close to the galactic plane ($\mathrm{b} = 0.99°$), it is viewed against the diffuse emission of the galactic ridge. Therefore, the standard BeppoSAX background subtraction technique, where deep blank field exposures obtained at high galactic latitudes are used, is inappropriate. Instead, a LECS background spectrum was extracted from a semi-annulus in the same field of view as the source, using the procedure described in Parmar et al. (1999). A MECS background spectrum was extracted from the complement of the source extraction region within the inner 8′ around the optical center. The spectrum was then rescaled using a multiplicative energy-independent factor to take into account mirror vignetting. Again, the uncertainties are dominated by counting statistics. Both extracted spectra were rebinned to oversample the full width half maximum of the energy resolution by a factor 3 and to have additionally a minimum of 20 counts per bin to allow use of the $\chi^2$ statistic. Data were selected in the energy ranges 1.0–7.0 keV (LECS) and 1.8–10.0 keV (MECS).

Fig. 2 shows the LECS and MECS spectra together with the best-fit model obtained with a simultaneous fit. Initial fits constrained the absorbing column to be $<2.3 \times 10^{22}$ atom cm$^{-2}$ at 90% confidence, so this parameter was was subsequently held fixed at the best-fit ROSAT value of Johnston et al. (1995) of $1.8 \times 10^{22}$ atom cm$^{-2}$. The best-fit (chance likelihood for $\chi^2$, P, $\simeq 23\%$) model is the combination of a blackbody with a temperature, kT, of $0.34\pm^{0.16}_{0.17}$ keV and a power-law with a photon index, $\Gamma$, of $1.0\pm^{1.0}_{1.3}$ for a $\chi^2$ of 25.7 for 22 degrees of freedom (dof). All spectral uncertainties are quoted at 90% confidence level for one interesting parameter and all luminosities are for a distance of 4.5 kpc (Ortolani et al. 1993). The ratio between the thermal and non-thermal fluxes in the 1–10 keV energy range is 1.3. In the simple assumption of spherical geometry, the emission area of the blackbody is $12\pm^{4}_{3}$ km$^2$. Marginally worse fits are obtained if power-law ($\Gamma = 2.2\pm^{0.5}_{0.6}$; $\chi^2 = 31.6$ for 24 dof; $\mathrm{P} \simeq 16\%$) or single temperature bremsstrahlung

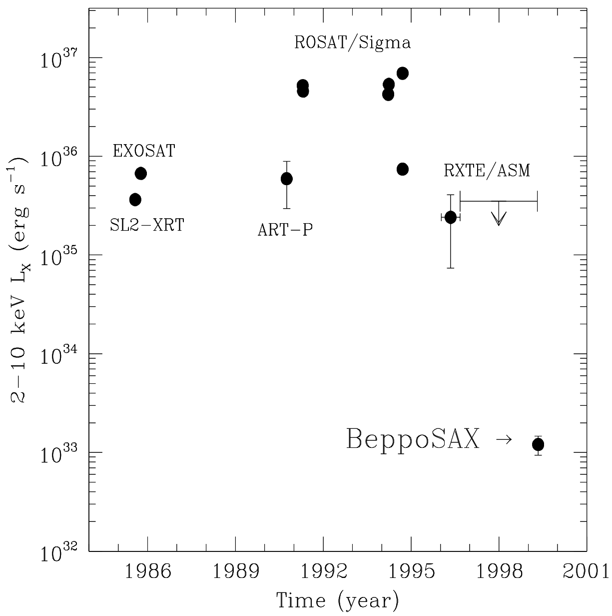


**Fig. 3.** The 2–10 keV historical light curve of X 1732-304. The ordinate error bars represent the variability range within each observation, except for the RXTE and BeppoSAX observations, where the statistical uncertainty at 90% confidence for one interesting parameter is shown

**Table 1.** X 1732-304 best-fit spectral parameters. In all cases the photoelectric absorption was fixed at a value of $1.8 \times 10^{22}$ atom cm$^{-2}$

| Model | $\Gamma$ | kT (keV) | $\chi^2$/dof |
|---|---|---|---|
| Power-law (PL) | $2.2\pm^{0.5}_{0.6}$ | ... | 31.6/24 |
| Bremsstrahlung | ... | $7\pm^{18}_{4}$ | 33.8/24 |
| PL + blackbody | $1.0\pm^{1.0}_{1.3}$ | $0.34\pm^{0.17}_{0.16}$ | 25.7/22 |

models ($\mathrm{kT} = 7\pm^{18}_{4}$ keV; $\chi^2 = 33.8$ for 24 dof; $\mathrm{P} \simeq 8\%$) are employed. The best-fit spectral parameters are given in Table 1. An F-test indicates that the reduction in $\chi^2$ due to the addition of the blackbody to the power-law model is significant at the 90% confidence level. The observed 2–10 keV flux of $(4.8 \pm 1.1) \times 10^{-13}$ erg cm$^{-2}$ s$^{-1}$, corresponds to an unabsorbed luminosity of $(1.4 \pm 0.3) \times 10^{33}$ erg s$^{-1}$.

## 4. Discussion

Fig. 3 shows the historical light curve of the 2–10 keV luminosity of X 1732-304. Data are from Borrel et al. (1996) and references therein, except the RXTE All-Sky Monitor (ASM) light curve which was retrieved from the public archive. The uncertainties on the ASM data points include standard 3% systematics. Two ASM measurements are shown in Fig. 3. This is because a 3.1$\sigma$ detection is obtained when the first 9 months of data are accumulated and a 90% confidence upper limit is quoted for the remainder of the data. When the reported fluxes are expressed in different energy bands, they are converted to the 2–10 keV energy range assuming a power-law model with $\Gamma = 2.1$ (Parmar et al. 1989) and $\mathrm{N_H} = 1.8 \times 10^{22}$ atom cm$^{-2}$ (unless different values are provided with the flux). The luminosity of X 1732-304 varied erratically by a factor $\gtrsim$20 between $3 \times 10^{35}$ and $7 \times 10^{36}$ erg s$^{-1}$ before the BeppoSAX observation. BeppoSAX measured a decrease in flux of a factor $\gtrsim$300, in comparison with the previous lowest measure. The luminosity of this low-state resembles that of NS soft X-ray transients (SXT) in quiescence (Asai et al. 1998; Menou et al. 1999).

### 4.1. *Comparison with the historical light curves of bright GC sources*

Currently 12 Galactic globular clusters are known to contain luminous X-ray sources. Four of these have exhibited variations in their persistent emission by a factor $>$50. The pattern of variability is far from homogeneous. The sources located in NGC 6440 and NGC 6712 show occasional outbursts during which they brighten by a factor $>$100 from a persistent luminosity of $\sim$$10^{35}$–$10^{36}$ erg s$^{-1}$ (Bradt & McClintock 1983). A recent BeppoSAX observation of an outburst from NGC 6440 (In 't Zand et al. 1999) revealed a decaying source with an exponential e-folding time of 6 days. This source may also have been responsible for the 1971 outburst (Markert et al. 1975). This temporal variability is, however, clearly different from that discussed here. X 1732-304 has dimmed from an average persistent luminosity of $\sim$$10^{35}$–$10^{36}$ erg s$^{-1}$ for the first time in 15 years by a factor $\gtrsim$300.

The ROSAT All-Sky Survey (RASS) revealed two sources which may show similar variability to X 1732-304. The source X 1745-248 in Terzan 5 was detected in the RASS at a flux level a factor 50 higher than the *Einstein* measure (Verbunt et al. 1995). The 0.5–20 keV luminosity of its faintest state is $1.3 \times 10^{34}$ erg s$^{-1}$, corresponding to a 2–10 keV luminosity of $8.8 \times 10^{33}$ erg s$^{-1}$, assuming the spectral shape in Verbunt et al. (1995). Similarly, GRS 1747-312 in Terzan 6 was observed to be a factor of $\gtrsim$150 brighter than in a previous pointed ROSAT HRI observation when the source was not detected. Again, assuming the spectral shape in Verbunt et al. (1995), the upper limit to the 0.1–2.4 keV luminosity is $< 1.9 \times 10^{34} \mathrm{d}_{12}^2$ erg s$^{-1}$, where $\mathrm{d}_{12}^2$ is the distance in units of 12 kpc (the distance to Terzan 6 is not well constrained, cf. Hertz & Wood 1985 and Djorgovski 1993). Thus the temporal variability of the sources in Terzan 5 and 6 resembles that of X 1732-304 discussed here. However, our discovery is remarkable in two respects: the persistent flux variations have the highest amplitude so far measured, and a spectroscopic measure of the ultra-dim state was possible with BeppoSAX for the first time.

Fig. 4 shows ASM light curves of 8 bright Galactic globular cluster sources which are being monitored. RXTE is provideing the first homogeneous set of long-term light curves from a sizeable sample of bright Galactic globular cluster X-ray sources. The ASM count rates have been converted to luminosities assuming the distances in Christian & Swank (1997), except for Terzan 2 (Ortolani et al. 1997), NGC 6440 (Ortolani et al. 1994) and NGC 6652 (Djorgovski 1993). The sources are separated into "persistent" (left panels) and "transient" (right panels) according to the definition in Verbunt et al. (1995). No luminosity variations above a factor 5 are observed, except in the recurrent

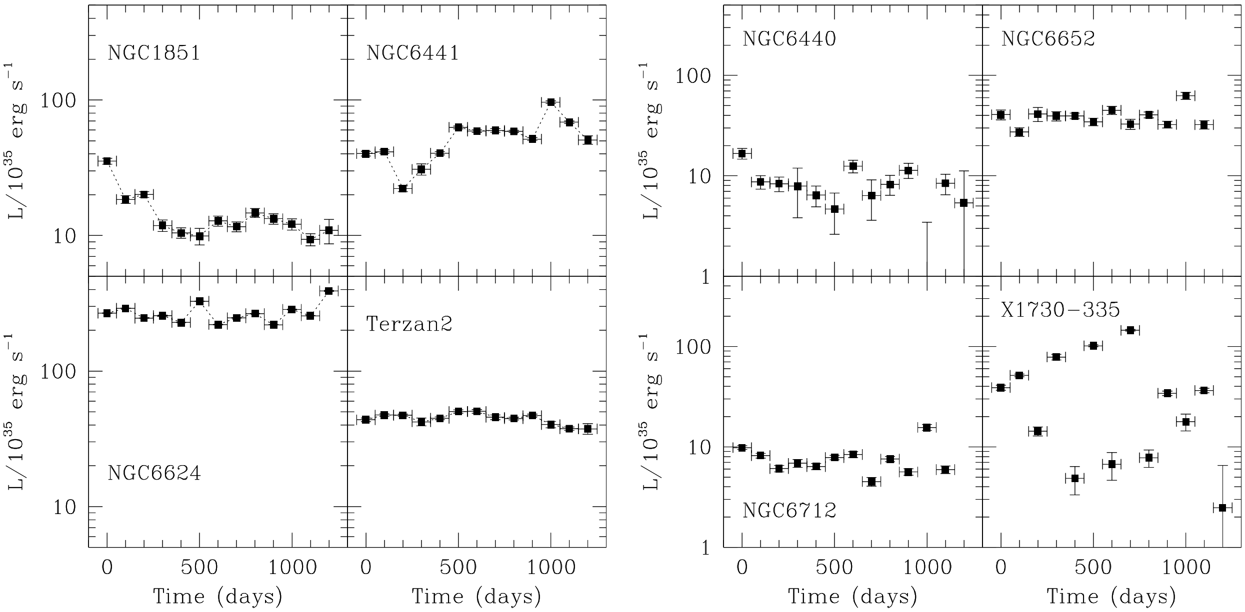


**Fig. 4.** Light curves of the X-ray bright globular cluster sources currently being monitored by RXTE. The binning time is 100 days. The sources are separated into "persistent" (left panels) and "transient" (right panels), according to the Verbunt et al. (1995) definition. X 1730-335 is the Rapid Burster in Liller 1

transient X 1730-335 (the Rapid Burster) in Liller 1. This lack of variability emphasises that the dramatic dimming reported here is extremely rare.

We cannot reliably estimate the timescale of the X-ray dimming of X 1732-304 from the historical light curve (Fig. 3). A gradual reduction from the last 1994 ROSAT/Sigma to the BeppoSAX observation cannot be excluded. However, we note that the existence of two separate "states", with a very short transition time is consistent with the "gap" between $10^{34.5}$ erg s$^{-1}$ and $10^{35.5}$ erg s$^{-1}$ in the globular cluster X-ray source luminosity function noted by Hertz & Grindlay (1983) and Hertz & Wood (1985).

### 4.2. Possible mechanisms for the observed dimming

The observed dramatic dimming of the X-ray luminosity in X1732-304 can be due either to a drastic reduction in accretion rate, or to a strong obscuration of the central X-ray source which is then only observed via scattering and/or reflection.

Iliarionov & Sunyaev (1975) proposed the "propeller effect" as a way of inhibiting accretion onto a magnetized compact object. This occurs when the corotation radius $\mathrm{r_{co}} \equiv (\mathrm{GM}/4\pi^2\nu_{\mathrm{spin}}^2)^{1/3}$ is smaller than the magnetospheric radius $\mathrm{r_m}$ (M is the NS mass) and the centrifugal force at $\mathrm{r_m}$ is therefore larger than the gravitational force. If X 1732-304 was spun-up in such a way that:

$$\nu_{\mathrm{spin}} > 1.7(\mathrm{M}/\mathrm{M}_\odot)^{6/7}(\dot{\mathrm{M}}/\dot{\mathrm{M}}_{\mathrm{E}})_{0.1}^{3/7}\mathrm{B}_8^{-6/7}\mathrm{r}_{\mathrm{NS},6}^{-18/7}\ \mathrm{kHz}$$

the propeller effect would operate (King 1995). Here $(\dot{\mathrm{M}}/\dot{\mathrm{M}}_{\mathrm{E}})_{0.1}$ is the accretion rate in units of 0.1 times Eddington, $\mathrm{B}_8$ the dipolar magnetic field in units of $10^8$ Gauss and $\mathrm{r}_{\mathrm{NS},6}$ is the NS radius in units of $10^6$ cm. The implied kHz spin frequency is in good agreement with those observed in some NS SXT such as Aquila X-1 (Zhang et al. 1998) and SAX J1808.4-3658 (Wijnands & van der Klis 1998; Chakrabarti & Morgan 1998). Campana et al. (1998) interpret the change in properties as Aquila X-1 transitioned from outburst to quiescence as being due to the onset of the propeller mechanism. Interestingly, the quiescent spectrum of Aquila X-1 may be modeled by the superposition of blackbody ($\mathrm{kT} \simeq 0.3$ keV) and hard power-law ($\Gamma = 1$) components. Campana et al. (1998) suggest that Aquila X-1 could be the progenitor of a millisecond recycled radio pulsar and they interpret the hard power-law tail as the shock emission from the interaction between a radio pulsar wind and the matter outflowing from the companion.

In standard thin accretion disk theory, the propeller effect completely inhibits accretion onto the NS surface. However, low-level X-ray emission is still present during the BeppoSAX observation. This can be explained if the accretion occurs, even partly, in a spherical flow. In this case, the centrifugal force is proportional to the polar angle $\theta$ from the NS spin axis and hence some material can accrete close to the polar axis. The observed blackbody emission may then originate from the polar regions. The fraction, f, of the NS surface that is emitting is given by:

$$\mathrm{f} \simeq \frac{\theta_0^2}{2}\frac{\mathrm{r_{NS}}}{\mathrm{r_m}}$$

(Menou et al. 1999). Here $\theta_0 \simeq \nu_{\mathrm{Keplerian}}(\mathrm{r_m})/\nu_{\mathrm{spin}}$. If $\mathrm{f} = 0.007$ ($\equiv 12\ \mathrm{km}^2/[4\pi(12\ \mathrm{km})^2]$, see Sect. 3), and assuming $\mathrm{B} = 10^8$ G, $\nu_{\mathrm{spin}} = 10^3$ Hz, and $\mathrm{M} = 1.4\mathrm{M}_\odot$, it follows $\dot{\mathrm{M}}/\dot{\mathrm{M}}_{\mathrm{E}} \simeq 10^{-4}$, in good agreement with the observed low-level luminosity of X 1732-304.

Accretion can be made highly inefficient if it occurs in an Advection Dominated flow (ADAF; Narayan & Yi 1995; Lasota

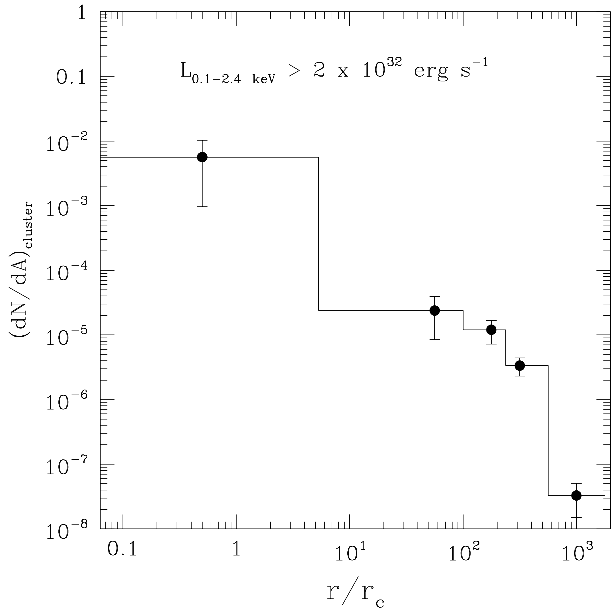


**Fig. 5.** Number density of X-ray sources per cluster per unit area as a function of the distance from the cluster core (Johnston et al. 1994). All distances are normalized to the core radius. Only sources detected in core-collapsed clusters with luminosities $>2\times10^{32}$ erg s$^{-1}$ are shown

et al. 1996). In this scenario, most of the binding energy is carried by a bulk flow of hot plasma onto the compact object, without being substantially reradiated. This model has been very successful in explaining the characteristics of black hole transients in quiescence. In the case of NS, Menou et al. (1999) argue that only 0.5–10 keV luminosities $>10^{34}$ erg s$^{-1}$ can be produced since the infalling material impacts a hard surface where it radiates efficiently, unless the bulk of the matter is prevented from accreting onto the NS by some external mechanism (e.g., the propeller effect). This luminosity level is significantly higher than that extrapolated from the BeppoSAX observation best-fit model of X 1732-304 ($<4 \times 10^{33}$ erg s$^{-1}$).

Alternatively, the line of sight to the central X-ray source could be obscured during the low-level state, and the residual X-rays could originate via scattering in a hot corona, or by reflection from some other region in the system. Parmar et al. (1989) fitted the X 1732-304 EXOSAT spectrum with a power-law with $\Gamma = 2.1$ or with a 6.3 keV thermal bremsstrahlung (in the latter case with a slightly lower value of the absorbing column density, $N_H = 0.8 \times 10^{22}$ atom cm$^{-2}$). Therefore, the BeppoSAX spectrum has a similar overall shape as observed by EXOSAT, but is a factor 400 times fainter.

The absorbing matter could be located at the radiatively bloated inner region of the accretion disk. A "bloated-disk" geometry has been proposed to explain the low frequency QPOs observed in several LMXRBs (Stella et al. 1987). In a different context, Nelson et al. (1997) and van Kerkwijk et al. (1998) suggest that warping instabilities in the accretion flow could cause the inner regions to have tilts $>90°$ during intervals of accretion torque reversal. In this case, the X-ray source would be mostly observed through the accretion disk. This can result in column densities as high as $\sim 10^{25}\alpha^{-4/5}$ atom cm$^{-2}$ (van Kerkwijk et al. 1998), where $\alpha$ is the viscosity parameter. Although there are several problems in applying the warped disk model to torque reversals (cf. Sect. 3.3 in van Kerkwijk et al. 1998), it remains likely that any such warping instabilities would be associated with enhanced absorption and increased scattering. In this context, the low-state state of X 1732-304 would result from a change in the overall accretion torque which caused an interval of spin-down.

It may be possible to tell which of these mechanisms is responsible for the low-state by studying the optical companion. If the effects of X-ray reprocessing are still visible this would imply that the central X-ray source is still luminous, and that our line of sight is obscured. If no effects due to reprocessing are visible, then it is likely that the accretion rate is strongly reduced. However, an optical identification is still required. The recent discovery of the radio counterpart to X 1732-304 (Martì et al. 1998) leaves at least four objects in the radio error box. Deutsch et al. (1998b) estimate the expected range of $\lambda$336 magnitude to be between 23 and 27, which might be accessible with the Wide Field Camera on board the Hubble Space Telescope.

### 4.3. *Could the BeppoSAX source be misidentified?*

HEAO-1 (Hertz & Wood 1985), *Einstein* (Hertz & Grindlay 1983) and ROSAT (Hasinger et al. 1994; Johnston et al. 1994) observations of globular clusters revealed the existence of a population of faint X-ray sources. The ROSAT sources exhibit 0.1–2.4 keV luminosities in the range 1–$6\times10^{32}$ erg s$^{-1}$. The extrapolated 0.1–2.4 keV luminosity of the source detected by BeppoSAX is $2\times10^{32}$ erg s$^{-1}$, well within the above range. It is therefore possible that the source detected by BeppoSAX is *not* X 1732-304, but a nearby faint source. A reanalysis of a ROSAT HRI pointed observation of the Terzan 1 field does not reveal any other sources close to X 1732-304. However, a source with the same luminosity as measured by BeppoSAX could have missed detection in this short ($\simeq$1.9 ks) ROSAT exposure. It is difficult to quantify the probability of a chance occurrence of a faint source near X 1732-304. The luminosity distribution function is not well enough constrained to allow reasonable predictions for individual clusters (Hertz & Wood 1985). Johnston et al. (1994) used the ROSAT Position Sensitive Proportional Counter to observe a small sample of nine nearby low absorption clusters. In Fig. 5 the number density of sources per cluster, normalized to the core radius is shown. It includes only sources detected in the four core-collapsed clusters of the Johnston et al. (1994) survey (NGC 6397, NGC 6544, NGC 6752, NGC 7099), whose luminosity is $>2 \times 10^{32}$ erg s$^{-1}$. The function can be approximated by a power-law of the shape: $10^{\beta}(r/r_c)^{\alpha}$, with $\alpha = 1.4 \pm 0.5$ and $\beta = -2.4 \pm 1.0$. This implies that the expected number of sources within $1'$ ($2'$) of the center of Terzan 1 at this luminosity threshold is 0.26 (0.40).

We note that the Johnston et al. (1994) survey is incomplete, and its sensitivity limit (typically a few $10^{-14}$ erg cm$^{-2}$ s$^{-1}$), strongly depends on the intervening absorption. It is also unclear if the spatial distribution of faint X-ray sources is homogeneous from cluster to cluster, when normalized to the core radius. There is still no clear understanding of the nature of these faint sources (see Sect. 4.2 of Johnston et al. 1994) and therefore no reason to suppose that they come from a homogeneous population. Nevertheless, the hypothesis that the source detected by BeppoSAX is not X 1732-304 cannot be excluded. If this hypothesis is true, the observed dimming of X 1732-304 is even more remarkable. This would not affect most of the conclusions of this *paper*, except that no special mechanism would be required to produce the observed residual flux.

*Acknowledgements.* The BeppoSAX satellite is a joint Italian-Dutch program. MG acknowledges an ESA Research Fellowship. We acknowledge quick-look results provided by the ASM/RXTE team. This research has made use of data obtained through the High Energy Astrophysics Science Archive Research Center on-line Service, provided by the NASA/ Goddard Space Flight Center.

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